Measuring the Impact of Restored Shoreline from a Student-Driven Salt Marsh Restoration Program in South Carolina, U.S.A.

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ABSTRACT

Tidal salt marshes are routinely described as critical, semi-inundated ecosystems that provide habitat for numerous coastal species, protection from wave action and erosion and improvement in nutrient productivity. Additionally, salt marshes are unique in their ability to filter excess nutrient runoff in the surrounding water through various chemical processes. Because of these benefits, wetland restoration, and more specifically marsh restoration, is a priority in coastal areas around the United States, where aggressive destruction of the ecosystem occurs. Coastal restoration projects vary in techniques used, with the majority focusing on regrowth of natural vegetation. In South Carolina, native vegetation establishment and growth is used as the prominent method to restore salt marshes to their natural functioning state. The South Carolina Sea Grant Consortium (SCSGC)'s From Seeds to Shoreline Program provides K-12 students and teachers with opportunities to engage in salt marsh restoration projects through the cultivation and transplantation of Spartina alterniflora (smooth cordgrass), the dominant plant in South Carolina coastal salt marshes. The direct effect and success of this student-driven program has not been evaluated for shoreline impact. This thesis study will determine the success of the program with regard to shoreline impact at three selected locations in Charleston County, SC, using specific pre-determined variables. Stem height, stem density, and total vegetation cover of planted S. alterniflora will be measured bimonthly for 12 consecutive months. The results from this study will gauge the impact of student-driven restoration efforts in South Carolina salt marshes as well as investigate potential monitoring protocol that could be incorporated into projects for the future.

BACKGROUND

Tidal salt marsh habitats are valued for their numerous ecosystem functions including (Tiner 2013, Neckles et al. 2013, Konisky et al. 2006):

- Habitat for shorebirds and other estuarine species
- Protection from wave action and erosion
- Commercial fish and shellfish zones
- Recreation and cultural experiences
- Improvement in water quality from runoff sources[1]

Although each of these functions are important, improvement of water quality is vital factor for the overall health of the ecosystem. Polluted water enters the salt marsh and is filtered, by denitrification, eliminating toxins and harmful contaminants. Filtration is needed to support multiple functions of the ecosystem, including a commercial fishing industry and other economic resources of coastal areas.

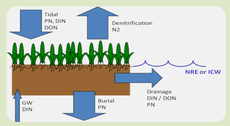


Figure 1: Water in a salt marsh is filtered through a denitrification process.
Photo Credit: dcerp.rti.org

INTRODUCTION

Because of the salt marsh's importance to water quality, and its other benefits, in 2011, the South Carolina Sea Grant Consortium, in partnership with the Clemson University Extension and South Carolina Department of Natural Resources, launched the "From Seeds to Shoreline Program: Engaging Students in Salt Marsh Restoration" (S2S). The goals of this program are:

- Educate students on the importance of salt marsh environments through active restoration of *Spartina alterniflora* (smooth cordgrass): the dominant marsh plant
- Engage students in each step of the restoration process including, seed germination, cultivation, and planting[2,3]
- Encourage environmental stewardship of marsh ecosystems

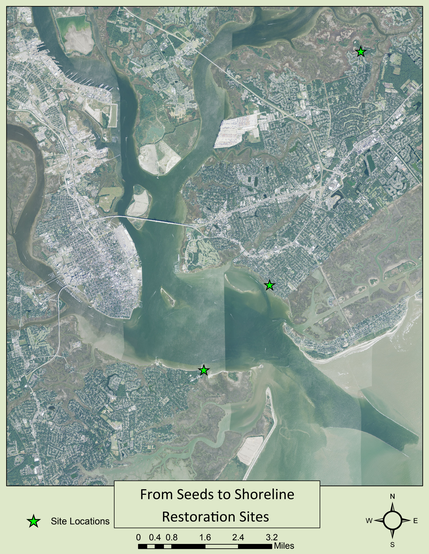
Figure 2: *Spartina* seedlings are germinated, cultivated in soil, and transplanted at various restoration sites.

Figure 3: Students from Murray LaSaine Elementary Students work together to plant *Spartina*.
Photo Credit: SC Sea Grant

OBJECTIVES

- Obtain bimonthly measurements of *Spartina alterniflora* stem density, stem height, vegetation cover at three locations over the course of twelve months
- Evaluate growth measurements to determine success of the S2S program and the impacts of restoration on natural shorelines
- Develop a site profile for the selection of sites for the S2S program
- Establish baseline best practices for transplanting protocol

STUDY SITES (CHARLESTON, SC)



Alhambra Hall: Mount Pleasant, SC (center)	• Adjacent to oyster reef • Frequently impacted by harbor boat traffic
Palmetto Islands County Park: Mount Pleasant, SC (upper right)	• Protected by tidal creek • Rarely impacted by harbor traffic
Dept. of Natural Resources: James Island, SC (lower left)	• Behind natural vegetation • Frequently impacted by harbor boat traffic

METHODS

- *Spartina* seeds were collected and germinated according to S2S program protocol
- 54 seedlings were planted in 1m X 1m quadrants in low and mid-marsh zones at each site[4]
- Bimonthly measurements of stem height, stem density and total vegetation at each site were recorded over 12 consecutive months.
- Soil samples were taken at each site and analyzed for composition
- Water samples were taken at each site and analyzed to measure salinity

Figure 4: Mid-marsh quadrants at Palmetto Islands County Park site.

ANTICIPATED FINDINGS

- Results will be used to determine the best site profile, with regard to location, soil and water composition, for future restoration projects.
- Overall growth is expected to be successful at sites protected from wave energy and pedestrian traffic.
- Growth is also expected to be successful at sites with nutrient rich sediment.

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